

CLAIMS

- 1 1. An automatic mixing and injecting apparatus comprising:
- 2 a. a housing having a cavity and a proximal and a distal end;
- 3 b. a syringe assembly within the housing cavity, the syringe assembly
- 4 further comprising:
- 5 (1) a first chamber for holding a liquid;
- 6 (2) a second chamber for holding a dry medicine, the second chamber
- 7 disposed distally to the first chamber; the second chamber releasably
- 8 sealed with respect to the first chamber;
- 9 (3) a needle, the needle disposed distally of the second chamber; and,
- 10 (4) a plunger; the plunger having a plunger shaft disposed
- 11 proximally; the plunger being operable to force the liquid from the first
- 12 chamber into the second chamber; and,
- 13 c. a driver spring within the housing, the driver spring engaging the plunger
- 14 shaft, and operable when released to inject the needle and displace the liquid
- 15 from the first chamber, through the second chamber and through the needle.

- 1 2. The automatic mixing and injecting apparatus of claim 1, further comprising:
- 2 a. spring-to-plunger coupling engaging the plunger shaft and the
- 3 driver spring; and,
- 4 b. a splitter; the splitter attached to the housing distally to the
- 5 spring-to-plunger coupling; the splitter further having a surface for
- 6 engaging the spring-to-plunger coupling and forcing the spring-to-
- 7 plunger coupling to disengage from the plunger shaft, thereby
- 8 disengaging the driver spring from the syringe assembly.

- 1 3. The automatic mixing and injecting apparatus of claim 2, where the plunger
- 2 shaft further comprises a circumferential groove; and, the spring-to-plunger coupling
- 3 further comprises:

- 4 a. a plurality of axial slits; and,
- 5 b. a radial lip for releasably engaging the circumferential groove,
- 6 so that the radial lip disengages from the circumferential groove as the spring-to-plunger
- 7 coupling engages the splitter.

1 4. The automatic mixing and injecting apparatus of claim 1, further comprising:

- 2 a. a disk releasably sealing the first chamber from the second chamber; and,
- 3 b. at least one aperture in the wall of the second chamber allowing liquid
- 4 communication between the portion of the second chamber proximal to the
- 5 released disk and the portion of the second chamber distal to the released disk,
- 6 so that the liquid flows through the second chamber before being forced through
- 7 the needle.

1 5. The automatic mixing and injecting apparatus of claim 1, further comprising a

2 return spring; the return spring disposed between the housing and the syringe assembly;

3 the return spring urging the syringe assembly proximally.

1 6. The automatic mixing and injecting apparatus of claim 1, further comprising:

- 2 a. at least two compressible barbs; the barbs connected to the proximal end
- 3 of the plunger shaft;
- 4 b. the housing having a housing cap;
- 5 c. a rod moveably disposed within the housing cap; the rod having an
- 6 interior bore sized to receive the barbs in their compressed state; and,
- 7 d. a detent integral with the housing cap; the detent sized to engage the
- 8 barbs in their uncompressed state and prevent the distal movement of the plunger
- 9 shaft until the barbs are compressed.

1 7. The automatic mixing and injecting apparatus of claim 1 further comprising a

2 flexible septum; the flexible septum disposed proximally to the proximal end of the

3 needle and sealing the needle from the second chamber; so that liquid pressure in the

4 second chamber causes the septum to deflect distally until the septum is penetrated by

5 the proximal end of the needle.

- 1 8. An automatic mixing and injecting apparatus comprising:
- 2 a. a housing having a cavity and a proximal and a distal end;
- 3 b. a syringe assembly within the housing cavity, the syringe assembly
- 4 further comprising:
- 5 (1) a first chamber for holding a liquid;
- 6 (2) a second chamber; the second chamber disposed distally to the
- 7 first chamber;
- 8 (3) a disk releasably sealing the first chamber from the second
- 9 chamber;
- 10 (4) a needle disposed distally of the second chamber;
- 11 (5) a plunger; the plunger having a plunger shaft disposed
- 12 proximally; the plunger being operable to force the liquid from the first
- 13 chamber and cause the disk to release; and,
- 14 c. a least one aperture in the wall of the second chamber allowing liquid
- 15 communication between the portion of the second chamber proximal to the
- 16 released disk and the portion of the second chamber distal to the released disk,
- 17 so that the liquid flows through the second chamber before being forced through
- 18 the needle.

- 1 9. An automatic injecting apparatus comprising:
- 2 a. a housing having a cavity and a proximal and a distal end;
- 3 b. a syringe assembly within the housing, the syringe assembly further
- 4 comprising:
- 5 (1) a first chamber for holding a liquid;
- 6 (2) a needle; and,
- 7 (3) a plunger, the plunger having a plunger shaft disposed
- 8 proximally, the plunger being operable to force the liquid from the first
- 9 chamber;
- 10 c. the plunger shaft engaging a spring-to-plunger coupling;
- 11 d. a driver spring within the housing, engaging the spring-to-plunger
- 12 coupling, operable to the syringe assembly to inject the needle and displace the
- 13 liquid medicine through the needle; and,

14 f. a splitter attached to the plunger shaft distally to the spring-to-plunger
15 coupling; the splitter having a surface for engaging the spring-to-plunger
16 coupling and forcing the spring-to-plunger coupling to disengage from the
17 plunger shaft, thereby disengaging the driver spring from the syringe assembly.

1 10. The automatic injecting apparatus of claim 9, where the plunger shaft further
2 comprises a circumferential groove; and, the spring-to-plunger coupling further
3 comprises:

- 4 a. a plurality of axial slits; and,
5 b. a radial lip for releasably engaging the circumferential groove,
6 so that the radial lip disengages from the circumferential groove as the spring-to-plunger
7 coupling engages the splitter.

1 11. The automatic injecting apparatus of claim 9, further comprising:

- 2 a. a second chamber for holding a liquid;
3 b. a disk disposed between the first chamber and the second chamber; the
4 disk releasably sealing the first chamber from the second chamber; and,
5 c. a least one aperture in the wall of the second chamber allowing liquid
6 communication between the portion of the second chamber proximal to the
7 disengaged disk and the portion of the second chamber distal to the disengaged
8 disk, so that the liquid flows through the second chamber before being forced
9 through the needle.

1 12. An automatic mixing and injecting apparatus comprising:

- 2 a. a housing having a cavity and a proximal and a distal end;
3 b. a syringe assembly within the housing cavity, the syringe assembly
4 further comprising:
5 (1) a first chamber for holding a liquid;
6 (2) a second chamber for holding a dry medicine, the second chamber
7 disposed distally to the first chamber;
8 (3) a disk releasably sealing the first chamber from the second
9 chamber;

- 10 (4) a needle, the needle disposed distally of the second chamber;
- 11 (5) a plunger; the plunger having a plunger shaft disposed
12 proximally; the plunger being operable to force the liquid from the first
13 chamber into the second chamber;
- 14 (6) at least one aperture in the wall of the second chamber allowing
15 liquid communication between the portion of the second chamber
16 proximal to the released disk and the portion of the second chamber
17 distal to the released disk, so that the liquid flows through the second
18 chamber before being forced through the needle;
- 19 c. a driver spring within the housing, the driver spring engaging the plunger
20 shaft, and operable when released to inject the needle and displace the liquid
21 from the first chamber, through the second chamber and through the needle;
- 22 d. a spring-to-plunger coupling engaging the plunger shaft and the driver
23 spring;
- 24 e. a splitter; the splitter attached to the housing distally to the spring-to-
25 plunger coupling; the splitter further having a surface for engaging the spring-to-
26 plunger coupling and forcing the spring-to-plunger coupling to disengage from
27 the plunger shaft, thereby disengaging the driver spring from the syringe
28 assembly;
- 29 f. the plunger shaft further comprising a circumferential groove; and, the
30 spring-to-plunger coupling further comprising:
- 31 (1) a plurality of axial slits; and,
- 32 (2) a radial lip for releasably engaging the circumferential groove,
33 so that the radial lip disengages from the circumferential groove as the spring-to-
34 plunger coupling engages the splitter;
- 35 g. at least two compressible barbs; the barbs connected to the proximal end
36 of the plunger shaft;
- 37 h. a rod axially moveable within the housing; the rod having an interior
38 bore sized to receive the barbs in their compressed state; and,
- 39 i. a detent integral with the housing; the detent sized to engage the barbs in
40 their uncompressed state and prevent the distal movement of the plunger shaft
41 until the barbs are compressed;

- 42 j. a return spring; the return spring disposed between the housing and the
43 syringe assembly; the return spring urging the syringe assembly proximally; and,
44 k. a flexible septum; the flexible septum disposed proximally to the
45 proximal end of the needle and sealing the needle from the second chamber; so
46 that liquid pressure in the second chamber causes the septum to deflect distally
47 until it is penetrated by the proximal end of the needle.

AMENDED CLAIMS

[received by the International Bureau on 09 September 2002 (09.09.02);
claims 2 and 9 cancelled; original claims 1, 3, 8, 10 and 11 amended;
remaining claims unchanged (5 pages)]

- 1 1. An automatic mixing and injecting apparatus comprising:
 - 2 a. a housing having a cavity and a proximal and a distal end;
 - 3 b. a syringe assembly within the housing cavity, the syringe assembly
 - 4 further comprising:
 - 5 (1) a first chamber for holding a liquid;
 - 6 (2) a second chamber for holding a dry medicine, the second
 - 7 chamber disposed distally to the first chamber; the second
 - 8 chamber releasably sealed with respect to the first chamber;
 - 9 (3) a needle, the needle disposed distally of the second
 - 10 chamber; and,
 - 11 (4) a plunger; the plunger having a plunger shaft disposed
 - 12 proximally; the plunger being operable to force the liquid from the
 - 13 first chamber into the second chamber;
 - 14 (5) a spring-to-plunger coupling engaging the plunger shaft
 - 15 and the driver spring;
 - 16 (6) a splitter; the splitter attached to the housing distally to the
 - 17 spring-to-plunger coupling; the splitter further having a surface for
 - 18 engaging the spring-to-plunger coupling and forcing the spring-to-
 - 19 plunger coupling to disengage from the plunger shaft, thereby
 - 20 disengaging the driver spring from the syringe assembly; and,
 - 21 c. a driver spring within the housing, the driver spring engaging the
 - 22 plunger shaft, and operable when released to inject the needle and
 - 23 displace the liquid from the first chamber, through the second chamber
 - 24 and through the needle.

- 1 3. The automatic mixing and injecting apparatus of claim 1, where the plunger shaft
- 2 further comprises a circumferential groove; and, the spring-to-plunger coupling further
- 3 comprises:

- 4 a. a plurality of axial slits; and,
5 b. a radial lip for releasably engaging the circumferential groove,
6 so that the radial lip disengages from the circumferential groove as the spring-to-plunger
7 coupling engages the splitter.

- 1 4. The automatic mixing and injecting apparatus of claim 1, further comprising:
2 a. a disk releasably sealing the first chamber from the second chamber; and,
3 b. at least one aperture in the wall of the second chamber allowing liquid
4 communication between the portion of the second chamber proximal to the
5 released disk and the portion of the second chamber distal to the released disk, so
6 that the liquid flows through the second chamber before being forced through the
7 needle.

- 1 5. The automatic mixing and injecting apparatus of claim 1, further comprising a
2 return spring; the return spring disposed between the housing and the syringe assembly;
3 the return spring urging the syringe assembly proximally.

- 1 6. *The automatic mixing and injecting apparatus of claim 1, further comprising:*
2 a. at least two compressible barbs; the barbs connected to the proximal end
3 of the plunger shaft;
4 b. the housing having a housing cap;
5 c. a rod moveably disposed within the housing cap; the rod having an
6 interior bore sized to receive the barbs in their compressed state; and,
7 d. a detent integral with the housing cap; the detent sized to engage the
8 barbs in their uncompressed state and prevent the distal movement of the plunger
9 shaft until the barbs are compressed.

- 1 7. The automatic mixing and injecting apparatus of claim 1 further comprising a
2 flexible septum; the flexible septum disposed proximally to the proximal end of the
3 needle and sealing the needle from the second chamber; so that liquid pressure in the
4 second chamber causes the septum to deflect distally until the septum is penetrated by
5 the proximal end of the needle.

- 1 8. An automatic mixing and injecting apparatus comprising:
- 2 a. a housing having a cavity and a proximal and a distal end;
- 3 b. a syringe assembly within the housing cavity, the syringe assembly
- 4 further comprising:
- 5 (1) a first chamber for holding a liquid;
- 6 (2) a second chamber; the second chamber disposed distally to
- 7 the first chamber;
- 8 (3) a disk releasably sealing the first chamber from the second
- 9 chamber;
- 10 (4) a needle disposed distally of the second chamber;
- 11 (5) a plunger; the plunger having a plunger shaft disposed
- 12 proximally; the plunger being operable to force the liquid from the
- 13 first chamber and cause the disk to release;
- 14 (6) a spring-to-plunger coupling engaging the plunger shaft
- 15 and the driver spring;
- 16 (7) a splitter; the splitter attached to the housing distally to the
- 17 spring-to-plunger coupling; the splitter further having a surface for
- 18 engaging the spring-to-plunger coupling and forcing the spring-to-
- 19 plunger coupling to disengage from the plunger shaft, thereby
- 20 disengaging the driver spring from the syringe assembly; and,
- 21 c. a least one aperture in the wall of the second chamber allowing
- 22 liquid communication between the portion of the second chamber
- 23 proximal to the released disk and the portion of the second chamber distal
- 24 to the released disk, so that the liquid flows through the second chamber
- 25 before being forced through the needle.

- 1 10. The automatic injecting apparatus of claim 8, where the plunger shaft further
- 2 comprises a circumferential groove; and, the spring-to-plunger coupling further
- 3 comprises:
- 4 a. a plurality of axial slits; and,
- 5 b. a radial lip for releasably engaging the circumferential groove,
- 6 so that the radial lip disengages from the circumferential groove as the spring-to-plunger
- 7 coupling engages the splitter.

- 1 11. The automatic injecting apparatus of claim 8, further comprising:
2 a. a second chamber for holding a liquid;
3 b. a disk disposed between the first chamber and the second chamber; the
4 disk releasably sealing the first chamber from the second chamber; and,
5 c. a least one aperture in the wall of the second chamber allowing liquid
6 communication between the portion of the second chamber proximal to the
7 disengaged disk and the portion of the second chamber distal to the disengaged
8 disk, so that the liquid flows through the second chamber before being forced
9 through the needle.
- 1 12. An automatic mixing and injecting apparatus comprising:
2 a. a housing having a cavity and a proximal and a distal end;
3 b. a syringe assembly within the housing cavity, the syringe assembly further
4 comprising:
5 (1) a first chamber for holding a liquid;
6 (2) a second chamber for holding a dry medicine, the second chamber
7 disposed distally to the first chamber;
8 (3) a disk releasably sealing the first chamber from the second
9 chamber;
10 (4) a needle, the needle disposed distally of the second chamber;
11 (5) a plunger; the plunger having a plunger shaft disposed proximally;
12 the plunger being operable to force the liquid from the first chamber into
13 the second chamber;
14 (6) at least one aperture in the wall of the second chamber allowing
15 liquid communication between the portion of the second chamber
16 proximal to the released disk and the portion of the second chamber distal
17 to the released disk, so that the liquid flows through the second chamber
18 before being forced through the needle;
19 c. a driver spring within the housing, the driver spring engaging the plunger
20 shaft, and operable when released to inject the needle and displace the liquid from
21 the first chamber, through the second chamber and through the needle;

- 22 d. a spring-to-plunger coupling engaging the plunger shaft and the driver
23 spring;
- 24 e. a splitter; the splitter attached to the housing distally to the spring-to-
25 plunger coupling; the splitter further having a surface for engaging the spring-to-
26 plunger coupling and forcing the spring-to-plunger coupling to disengage from
27 the plunger shaft, thereby disengaging the driver spring from the syringe
28 assembly;
- 29 f. the plunger shaft further comprising a circumferential groove; and, the
30 spring-to-plunger coupling further comprising:
- 31 (1) a plurality of axial slits; and,
32 (2) a radial lip for releasably engaging the circumferential groove,
33 so that the radial lip disengages from the circumferential groove as the spring-to-
34 plunger coupling engages the splitter;
- 35 g. at least two compressible barbs; the barbs connected to the proximal end
36 of the plunger shaft;
- 37 h. a rod axially moveable within the housing; the rod having an interior bore
38 sized to receive the barbs in their compressed state; and,
- 39 i. a detent integral with the housing; the detent sized to engage the barbs in
40 their uncompressed state and prevent the distal movement of the plunger shaft
41 until the barbs are compressed;
- 42 j. a return spring; the return spring disposed between the housing and the
43 syringe assembly; the return spring urging the syringe assembly proximally; and,
- 44 k. a flexible septum; the flexible septum disposed proximally to the proximal
45 end of the needle and sealing the needle from the second chamber; so that liquid
46 pressure in the second chamber causes the septum to deflect distally until it is
47 penetrated by the proximal end of the needle.